10.7

A comparative study of microfracture vs drilling in a rabbit cartilage repair model

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Purpose: Bone marrow stimulation initiates cartilage repair via fracture repair in subchondral bone. Microfracture is the most popular technique, followed by drilling and abrasion arthroplasty, however no study has compared these techniques. The current study compares microfracture to drilling in a rabbit model and examines the effect of hole depth on repair responses.
Methods and Materials: Trochlear and condylar cartilage defects were prepared bilaterally in rabbits. Cylindrical holes 2mm or 6mm deep were made with a 0.9mm drill bit, while a mini-microfracture awl pierced conically shaped holes 2mm deep. Animals were sacrificed at 1 and 14 days and 3 months, and fixed joints were scanned by micro-CT followed by histological and immunohistochemical analyses of defects.
Results: Acute features of subchondral bone were distinct at one day post-operative comparing microfractured and drilled defects. Bone compaction around and between microfracture holes was accompanied by fracturing. In contrast there was a lack of compaction and fracturing between holes with drilling. The subchondral hematoma was extensive with both techniques and occupied ~5 times the volume of the holes and greater volumes with deeper holes. Heat necrosis due to drilling could not be identified. At 14 days post surgery, chondrogenic foci, the central mediating feature of successful cartilage repair, were observed more frequently in drilled compared to microfractured defects and were associated with higher levels of repair vascularization and new bone. Evaluation of 3-month repair is ongoing.
Conclusions: Significant differences in bone damage and repair responses were found between microfractured and drilled cartilage defects and may influence long term outcome.

11.3

Autologous conditioned serum (ACS) compared to hyaluronan and saline-injections for the treatment of knee osteoarthritis: therapeutic study, level I (ISRCTN: 71311752)

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Purpose: A new therapy, based on the intra-articular injection of autologous conditioned serum (ACS), is used in several European countries for osteoarthritis (OA) treatment. ACS is generated by incubating venous blood with medical grade glass beads. Peripheral blood leukocytes produce elevated amounts of endogenous anti-inflammatory cytokines and growth factors that are recovered in the serum. ACS has shown disease-modifying effects in horses, to enhance the healing of muscle injuries in animal models and in human athletes. In the present study, the efficacy and safety of ACS was compared to hyaluronan (HA), and saline in patients with knee OA.
Methods and Materials: In a prospective, randomized, patient- and observer-blind trial with three parallel groups, 376 patients with knee OA were included in an intention to treat (ITT-) analysis. Efficacy was assessed by patient-administered outcome instruments (WOMAC, VAS, GPA) after 7, 13 and 26 weeks. The frequency and severity of adverse events were used as safety parameters.
Results: In all groups, injections produced a significant reduction in OA- symptoms. However, responses to ACS were stronger and statistically significant for all outcome measures and all time points. No significant differences between HA treatment and saline injections ($p>0,05$, at all time points and all outcome measures) were recorded. Frequency of adverse advents (AE) was comparable in the ACS- and the saline-group ($p>0,05$).
Conclusions: Results show that ACS is effective and well tolerated in the management of chronic OA of the knee. ACS shows disease-modifying-effects in OA-models, but it remains to be determined whether they are chondroprotective or even chondroregenerative, sequelae.

11.4

Maintaining viability of osteochondral allografts for transplantation using directional freezing – 1 year follow-up clinical results

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Purpose: Directional freezing is a novel freezing method that offers a new approach to the process of freezing, enabling cryopreservation of articular cartilage for long term storage and successful preservation of viable cartilage cells. This study is designed to assess the safety and efficacy of cartilage tissue that has been cryopreserved using directional freezing in cartilage repair procedures.
Methods and Materials: Osteochondral allograft plugs, collected from human tissue donors below the age of 40, according to the EATB criteria, were processed and cryopreserved at the Western Hungarian Regional Tissue Bank. Cryopreservation was performed using a directional freezing system (MTG 1315). Out of each freezing batch one plug was sacrificed and tested for cell viability after thawing. Plugs were thawed in the operating theatre prior to transplantation and transplanted using a press fit technique. Patients were monitored and evaluated using physical examination, MRI, IKDC score, KSS score and SF-36 score. Evaluations were performed 6 weeks, 3 month, 6 month and 1 year post-op.
Results: Nine knees were harvested from 5 separate donors, a total of 58 osteochondral plugs were prepared out of which 15 plugs were tested for cell viability showing an average viability of 46.66%±5.47%. Eighteen plugs were transplanted into 12 patients suffering from grade 3 or 4 isolated cartilage lesions of the knee. All patients resumed weight bearing activity six weeks post surgery and reported improvement in function and relief of pain. MRI studies demonstrated rapid incorporation of the plugs in all 12 patients. IKDC and KSS scores improved gradually, from 40.3±9.75 to 80.85±10.3 ($p<0.05$) and from 59±22.8 to 96±7.5 ($p<0.05$), respectively.
Conclusions: Cryopreservation using directional freezing enables preservation of viable cells within the collagen matrix. The high percentage of viable cartilage cells, the quality of the matrix, and ability to store these grafts in a hospital facility, are encouraging to meet the growing demand of such allografts in human cartilage repair.

11.5

Successful results following cartilage repair in the knee using a novel synthetic osteochondral scaffold.

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Purpose: Porous, resorbable scaffolds offer a new solution for symptomatic osteochondral and chondral articular defects in the knee and other joints. This paper reports on early results of this novel off-the-shelf product.
Methods and Materials: 8 active sporting patients underwent cartilage repair using TruFit CB plugs (Smith and Nephew) for symptomatic defects on the medial or lateral femoral condyle. All had failed previous treatment (debridement in 6 and microfracture in 2). Postoperatively patients were touch weight bearing for 2 weeks and partial until 4 weeks. Data was collected prospectively.
Results: The overall mean age was 34.3 (range 21 – 50) and 5 were male. Four lateral femoral condyle defects were treated, all associated with lateral meniscal tears. Four medial defects were associated with ACL injury (1), PCL injury (1) or isolated chondral injury (2). Single plugs were required in 6 (9mm in 4 and 7mm plugs in 2) while 2 patients required 2 plugs (9mm and 7mm). All 8 patients were improved at mean follow up of 8 months with 4 currently back to full pre-injury level of sport. Subjective IKDC scores improved from 44.6 preop to 79 post op ($p<0.05$). 2nd look arthroscopy was undertaken in 2 showing well healed and well integrated surface.
Conclusions: These preliminary results indicate that TruFit CB plugs offer a potential solution for small focal chondral defects, offering an alternative to microfracture or osteochondral grafting with advantages of low morbidity and rapid recovery without the need for prolonged non-weight bearing.